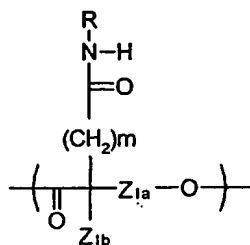


## CLAIMS

1. A polyhydroxyalkanoate comprising one or more units represented by the chemical formula (1) in a molecule,



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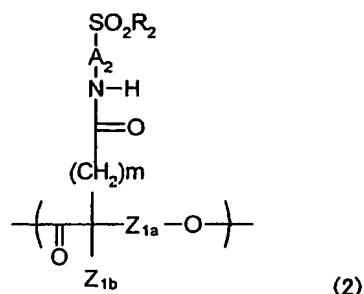
(1)

wherein R represents  $-\text{A}_1-\text{SO}_2\text{R}_1$ ,  $\text{R}_1$  represents OH, a halogen atom, ONa, OK, or  $\text{OR}_{1a}$ ,  $\text{R}_{1a}$  and  $\text{A}_1$  each independently represent a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure, or a substituted or unsubstituted heterocyclic structure,  $\text{Z}_{1a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof.  $\text{Z}_{1b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, m represents an integer selected from 0 to 8, and when multiple units exist, R,  $\text{R}_1$ ,  $\text{R}_{1a}$ ,  $\text{A}_1$ ,  $\text{Z}_{1a}$ ,  $\text{Z}_{1b}$ , and m each independently have the above meaning for each

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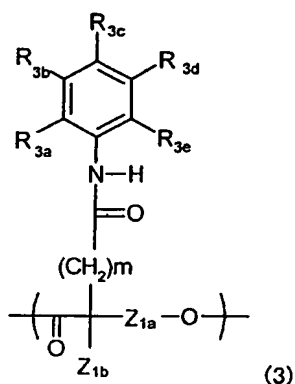
unit.

2. A polyhydroxyalkanoate according to claim 1, comprising one or more units each represented by the chemical formula (2), (3), (4A), or (4B) in a molecule as the one or more units each represented by the chemical formula (1):



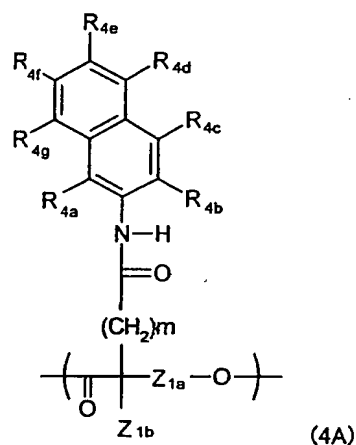
wherein  $\text{R}_2$  represents OH, a halogen atom, ONa, OK, or  $\text{OR}_{2a}$ ,  $\text{R}_{2a}$  represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group,  $\text{A}_2$  represents a linear or branched alkylene group having 1 to 8 carbon atoms,  $\text{Z}_{1a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $\text{Z}_{1b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group,  $m$  represents an integer selected from 0 to 8, and when multiple units

exist,  $A_2$ ,  $R_2$ ,  $R_{2a}$ ,  $Z_{1a}$ ,  $Z_{1b}$ , and  $m$  each independently have the above meaning for each unit,



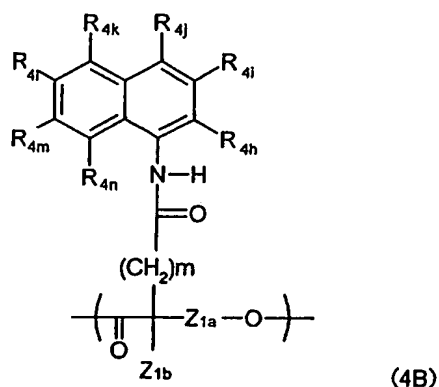
wherein  $R_{3a}$ ,  $R_{3b}$ ,  $R_{3c}$ ,  $R_{3d}$ , and  $R_{3e}$  each independently represent  $SO_2R_{3f}$  ( $R_{3f}$  represents OH, a halogen atom, ONa, OK, or  $OR_{3f1}$  ( $R_{3f1}$  represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an  $NH_2$  group, an  $NO_2$  group,  $COOR_{3g}$  ( $R_{3g}$  represents an H atom, an Na atom, or a K atom), an acetamide group, an OPh group, an NHPPh group, a  $CF_3$  group, a  $C_2F_5$  group, or a  $C_3F_7$  group (Ph represents a phenyl group), and at least one of these groups represents  $SO_2R_{3f}$ ,  $Z_{3a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a

thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{3b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group,  $m$  represents an integer selected from 0 to 8, and when multiple units exist,  $R_{3a}$ ,  $R_{3b}$ ,  $R_{3c}$ ,  $R_{3d}$ ,  $R_{3e}$ ,  $R_{3f}$ ,  $R_{3f1}$ ,  $R_{3g}$ ,  $Z_{1a}$ ,  $Z_{1b}$ , and  $m$  each independently have the above meaning for each unit,



wherein  $R_{4a}$ ,  $R_{4b}$ ,  $R_{4c}$ ,  $R_{4d}$ ,  $R_{4e}$ ,  $R_{4f}$ , and  $R_{4g}$  each independently represent  $SO_2R_{4o}$  ( $R_{4o}$  represents OH, a halogen atom, ONa, OK, or  $OR_{4o1}$  ( $R_{4o1}$  represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an  $NH_2$  group, an  $NO_2$  group,  $COOR_{4p}$  ( $R_{4p}$  represents an H atom, an Na atom, or a K atom), an acetamide group, an OPh

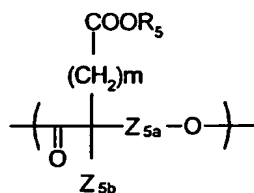
group, an NHP<sub>h</sub> group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, or a C<sub>3</sub>F<sub>7</sub> group (Ph represents a phenyl group), and at least one of these groups represents SO<sub>2</sub>R<sub>4o</sub>, Z<sub>1a</sub> represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof, Z<sub>1b</sub> represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, m represents an integer selected from 0 to 8, and when multiple units exist, R<sub>4a</sub>, R<sub>4b</sub>, R<sub>4c</sub>, R<sub>4d</sub>, R<sub>4e</sub>, R<sub>4f</sub>, R<sub>4g</sub>, R<sub>4o</sub>, R<sub>4o1</sub>, R<sub>4p</sub>, Z<sub>1a</sub>, and Z<sub>1b</sub>, and m each independently have the above meaning for each unit,



wherein R<sub>4h</sub>, R<sub>4i</sub>, R<sub>4j</sub>, R<sub>4k</sub>, R<sub>4l</sub>, R<sub>4m</sub>, and R<sub>4n</sub> each independently represent SO<sub>2</sub>R<sub>4o</sub> (R<sub>4o</sub> represents OH, a halogen atom, ONa, OK, or OR<sub>4o1</sub> (R<sub>4o1</sub> represents a

linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group)), a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an NH<sub>2</sub> group, an NO<sub>2</sub> group, COOR<sub>4p</sub> (R<sub>4p</sub> represents an H atom, an Na atom, or a K atom), an acetamide group, an OPh group, an NHPH group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, or a C<sub>3</sub>F<sub>7</sub> group (Ph represents a phenyl group), and at least one of these groups represents SO<sub>2</sub>R<sub>4o</sub>, m represents an integer selected from 0 to 8. Z<sub>1a</sub> represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof, Z<sub>1b</sub> represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and when multiple units exist, R<sub>4h</sub>, R<sub>4i</sub>, R<sub>4j</sub>, R<sub>4k</sub>, R<sub>4l</sub>, R<sub>4m</sub>, R<sub>4n</sub>, R<sub>4o</sub>, R<sub>4o1</sub>, R<sub>4p</sub>, Z<sub>1a</sub>, Z<sub>1b</sub>, and m each independently have the above meaning for each unit.

3. A polyhydroxyalkanoate comprising one or more units represented by the chemical formula (5):



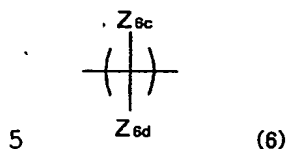
(5)

wherein  $R_5$  represents hydrogen, a group for forming a salt, or  $R_{5a}$ ,  $R_{5a}$  represents a linear or branched alkyl or aralkyl group having 1 to 12 carbon atoms, or a group having a saccharide,  $m$  represents an integer selected from 0 to 8,  $Z_{5a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{5b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and when multiple units exist,  $R_5$ ,  $R_{5a}$ ,  $Z_{5a}$ ,  $Z_{5b}$ , and  $m$  each independently have the above meaning for each unit.

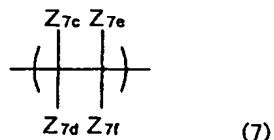
4. A polyhydroxyalkanoate according to claim 1, wherein the linear alkylene chain structure represented by  $Z_{1a}$  in the chemical formula (1) is selected from the following (A) to (D):

(A) when the linear alkylene chain has 1 carbon atom, in the linear alkylene chain structure represented by the chemical formula (6), one of  $Z_{6c}$  and  $Z_{6d}$

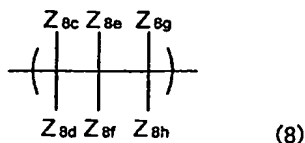
represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,



(B) when the linear alkylene chain has 2 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (7), one of  $\text{Z}_{7c}$ ,  $\text{Z}_{7d}$ ,  $\text{Z}_{7e}$ , and  $\text{R}_{7f}$  represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,

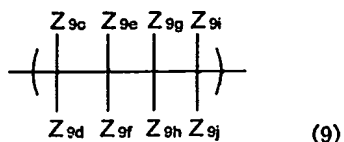


(C) when the linear alkylene chain has 3 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (8), one of  $\text{Z}_{8c}$ ,  $\text{Z}_{8d}$ ,  $\text{Z}_{8e}$ ,  $\text{Z}_{8f}$ ,  $\text{Z}_{8g}$ , and  $\text{Z}_{8h}$  represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,



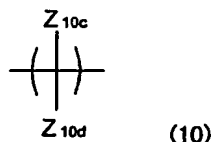


(D) when the linear alkylene chain has 4 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (9), one of  $Z_{9c}$ ,  $Z_{9d}$ ,  $Z_{9e}$ ,  $Z_{9f}$ ,  $Z_{9g}$ ,  $Z_{9h}$ ,  $Z_{9i}$ , and  $Z_{9j}$  represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof.



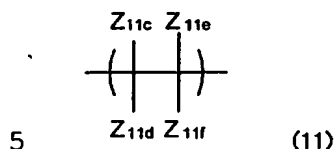
5. A polyhydroxyalkanoate according to claim 3, wherein the linear alkylene chain structure represented by  $Z_{5a}$  in the chemical formula (5) is selected from the following (A) to (D):

(A) when the linear alkylene chain has 1 carbon atom, in the linear alkylene chain structure represented by the chemical formula (10), one of  $Z_{10c}$  and  $Z_{10d}$  represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,

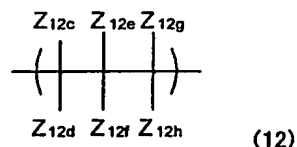


(B) when the linear alkylene chain has 2 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (11), one of  $Z_{11c}$ ,  $Z_{11d}$ ,  $Z_{11e}$ , and

Z<sub>11f</sub> represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,



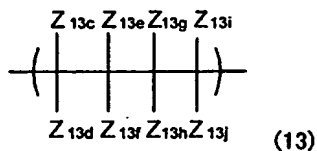
(C) when the linear alkylene chain has 3 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (12), one of Z<sub>12c</sub>, Z<sub>12d</sub>, Z<sub>12e</sub>, Z<sub>12f</sub>, Z<sub>12g</sub>, and Z<sub>12h</sub> represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,



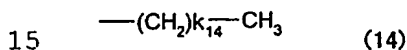
(D) when the linear alkylene chain has 4 carbon atoms, in the linear alkylene chain structure represented by the chemical formula (13), one of Z<sub>13c</sub>, Z<sub>13d</sub>, Z<sub>13e</sub>, Z<sub>13f</sub>, Z<sub>13g</sub>, Z<sub>13h</sub>, Z<sub>13i</sub>, and Z<sub>13j</sub> represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof.

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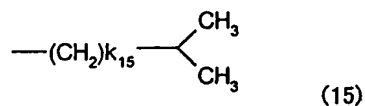
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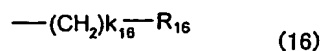
6. A polyhydroxyalkanoate according to claim 4 or 5, wherein when a substituent selected from Z<sub>6c</sub>, Z<sub>6d</sub>, Z<sub>7c</sub>, Z<sub>7d</sub>, Z<sub>7e</sub>, Z<sub>7f</sub>, Z<sub>8c</sub>, Z<sub>8d</sub>, Z<sub>8e</sub>, Z<sub>8f</sub>, Z<sub>8g</sub>, Z<sub>8h</sub>, Z<sub>9c</sub>, Z<sub>9d</sub>, Z<sub>9e</sub>, Z<sub>9f</sub>, Z<sub>9g</sub>, Z<sub>9h</sub>, Z<sub>9i</sub>, Z<sub>9j</sub>, Z<sub>10c</sub>, Z<sub>10d</sub>, Z<sub>11e</sub>, Z<sub>11d</sub>, Z<sub>11e</sub>, Z<sub>11f</sub>, Z<sub>12c</sub>, Z<sub>12d</sub>, Z<sub>12e</sub>, Z<sub>12f</sub>, Z<sub>12g</sub>, Z<sub>12h</sub>, Z<sub>13c</sub>, Z<sub>13d</sub>, Z<sub>13e</sub>, Z<sub>13f</sub>, Z<sub>13g</sub>, Z<sub>13h</sub>, Z<sub>13i</sub>, and Z<sub>13j</sub> described in the chemical formulae (6), (7), (8), (9), (10), (11), (12), and (13) represents a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof, the substituent is selected from substituents represented by the chemical formulae (14), (15), (16), and (17):



wherein  $k_{14}$  represents an integer selected from 0 to 8, and when multiple units exist,  $k_{14}$ 's each independently have the above meaning for each unit,

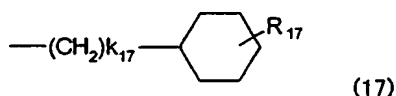


wherein  $k_{15}$  represents an integer selected from 0 to 7, and when multiple units exist,  $k_{15}$ 's each independently have the above meaning for each unit,



wherein  $k_{16}$  represents an integer selected from 1 to 8,

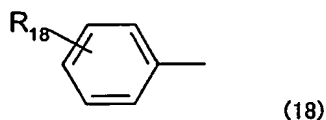
R<sub>16</sub> represents a substituent containing a residue having any one of a phenyl structure and a thienyl structure, and when multiple units exist, k<sub>16</sub> and R<sub>16</sub> each independently have the above meaning for each unit,



wherein R<sub>17</sub> represents a substituent to a cyclohexyl group selected from an H atom, a CN group, an NO<sub>2</sub> group, a halogen atom, a CH<sub>3</sub> group, a C<sub>2</sub>H<sub>5</sub> group, a C<sub>3</sub>H<sub>7</sub> group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, and a C<sub>3</sub>F<sub>7</sub> group, k<sub>17</sub> represents an integer selected from 0 to 8, and when multiple units exist, k<sub>17</sub> and R<sub>17</sub> each independently have the above meaning for each unit.

7. A polyhydroxyalkanoate according to claim 6, wherein R<sub>16</sub> in the chemical formula (16), which is a residue having any one of a phenyl structure and a thienyl structure, is selected from the group of residues represented by the chemical formulae (18), (19), (20), (21), (22), (23), (24), (25), (26), (27), and (28),

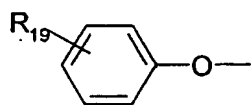
the chemical formula (18) below representing a group of unsubstituted or substituted phenyl groups,



wherein R<sub>18</sub> represents a substituent to an aromatic

ring selected from an H atom, a halogen atom, a CN group, an NO<sub>2</sub> group, a CH<sub>3</sub> group, a C<sub>2</sub>H<sub>5</sub> group, a C<sub>3</sub>H<sub>7</sub> group, a CH=CH<sub>2</sub> group, COOR<sub>18a</sub> (R<sub>18a</sub> represents an H atom, an Na atom, or a K atom), a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, and a C<sub>3</sub>F<sub>7</sub> group, and when multiple units exist, R<sub>18</sub>'s may be different for each unit,

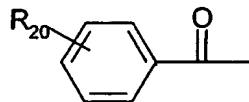
the chemical formula (19) below representing a group of unsubstituted or substituted phenoxy groups,



(19)

wherein R<sub>19</sub> represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an NO<sub>2</sub> group, a CH<sub>3</sub> group, a C<sub>2</sub>H<sub>5</sub> group, a C<sub>3</sub>H<sub>7</sub> group, a SCH<sub>3</sub> group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, and a C<sub>3</sub>F<sub>7</sub> group, and when multiple units exist, R<sub>19</sub>'s may be different for each unit,

the chemical formula (20) below representing a group of unsubstituted or substituted benzoyl groups,

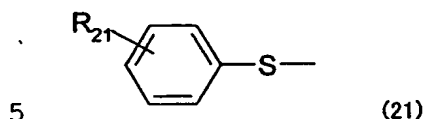


(20)

wherein R<sub>20</sub> represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an NO<sub>2</sub> group, a CH<sub>3</sub> group, a C<sub>2</sub>H<sub>5</sub> group, a C<sub>3</sub>H<sub>7</sub> group, a SCH<sub>3</sub> group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, and a C<sub>3</sub>F<sub>7</sub> group, and when multiple units exist, R<sub>20</sub>'s may

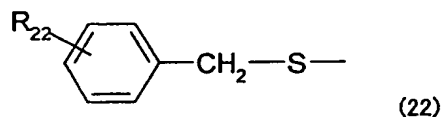
be different for each unit,

the chemical formula (21) below representing a group of unsubstituted or substituted phenylsulfanyl groups,



wherein  $R_{21}$  represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an  $\text{NO}_2$  group,  $\text{COOR}_{21a}$ ,  $\text{SO}_2\text{R}_{21b}$  ( $R_{21a}$  represents H, Na, K,  $\text{CH}_3$ , or  $\text{C}_2\text{H}_5$ , and  $R_{21b}$  represents OH, ONa, OK, a  
10 halogen atom,  $\text{OCH}_3$ , or  $\text{OC}_2\text{H}_5$ ), a  $\text{CH}_3$  group, a  $\text{C}_2\text{H}_5$  group, a  $\text{C}_3\text{H}_7$  group, a  $(\text{CH}_3)_2\text{-CH}$  group, and a  $(\text{CH}_3)_3\text{-C}$  group, and when multiple units exist,  $R_{21}$ 's may be different for each unit,

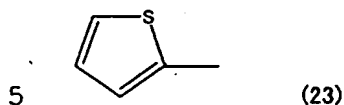
the chemical formula (22) below representing a  
15 group of unsubstituted or substituted (phenylmethyl)sulfanyl groups,



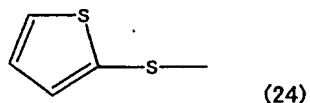
wherein  $R_{22}$  represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an  $\text{NO}_2$  group,  $\text{COOR}_{22a}$ ,  $\text{SO}_2\text{R}_{22b}$  ( $R_{22a}$  represents H, Na, K,  $\text{CH}_3$ , or  $\text{C}_2\text{H}_5$ , and  $R_{22b}$  represents OH, ONa, OK, a  
20 halogen atom,  $\text{OCH}_3$ , or  $\text{OC}_2\text{H}_5$ ), a  $\text{CH}_3$  group, a  $\text{C}_2\text{H}_5$  group, a  $\text{C}_3\text{H}_7$  group, a  $(\text{CH}_3)_2\text{-CH}$  group, and a  $(\text{CH}_3)_3\text{-C}$  group,

group, and when multiple units exist,  $R_{22}$ 's may be different for each unit,

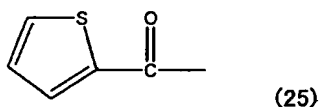
the chemical formula (23) below representing a 2-thienyl group,



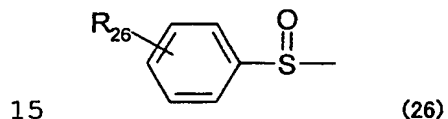
the chemical formula (24) below representing a 2-thienylsulfanyl group,



10 the chemical formula (25) below representing a 2-thienylcarbonyl group.



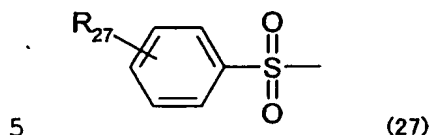
the chemical formula (26) below representing a group of unsubstituted or substituted phenylsulfinyl groups,



wherein  $R_{26}$  represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an  $\text{NO}_2$  group,  $\text{COOR}_{26a}$ ,  $\text{SO}_2\text{R}_{26b}$  ( $R_{26a}$  represents H, Na, K,  $\text{CH}_3$ , or  $\text{C}_2\text{H}_5$ , and  $R_{26b}$  represents OH, ONa, OK, a  
20 halogen atom,  $\text{OCH}_3$ , or  $\text{OC}_2\text{H}_5$ ), a  $\text{CH}_3$  group, a  $\text{C}_2\text{H}_5$  group, a  $\text{C}_3\text{H}_7$  group, a  $(\text{CH}_3)_2\text{-CH}$  group, and a  $(\text{CH}_3)_3\text{-C}$  group, and when multiple units exist,  $R_{26}$ 's may be

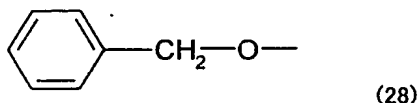
different for each unit,

the chemical formula (27) below representing a group of unsubstituted or substituted phenylsulfonyl groups,



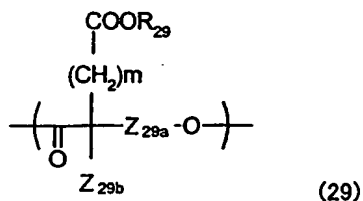
wherein  $R_{27}$  represents a substituent to an aromatic ring selected from an H atom, a halogen atom, a CN group, an  $\text{NO}_2$  group,  $\text{COOR}_{27a}$ ,  $\text{SO}_2\text{R}_{27b}$  ( $R_{27a}$  represents H, Na, K,  $\text{CH}_3$ , or  $\text{C}_2\text{H}_5$ , and  $R_{27b}$  represents OH, ONa, OK, a  
10 halogen atom,  $\text{OCH}_3$ , or  $\text{OC}_2\text{H}_5$ ), a  $\text{CH}_3$  group, a  $\text{C}_2\text{H}_5$  group, a  $\text{C}_3\text{H}_7$  group, a  $(\text{CH}_3)_2\text{-CH}$  group, and a  $(\text{CH}_3)_3\text{-C}$  group, and when multiple units exist,  $R_{27}$ 's may be different for each unit,

the chemical formula (28) below representing a  
15 (phenylmethyl)oxy group,

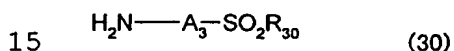


8. A method of producing a polyhydroxyalkanoate containing a unit represented by the chemical formula (1), comprising the step of subjecting a  
20 polyhydroxyalkanoate containing a unit represented by the chemical formula (29) and at least one kind of amine compound represented by the chemical formula (30) to a condensation reaction,

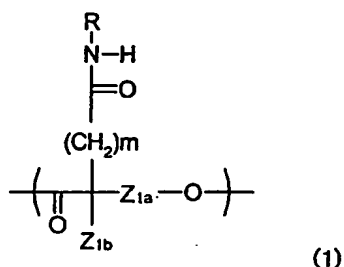




wherein  $R_{29}$  represents hydrogen or a group for forming a salt,  $m$  represents an integer selected from 0 to 8,  $Z_{29a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{29b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and when multiple units exist,  $R_{29}$ ,  $Z_{29a}$ ,  $Z_{29b}$ , and  $m$  each independently have the above meaning for each unit,



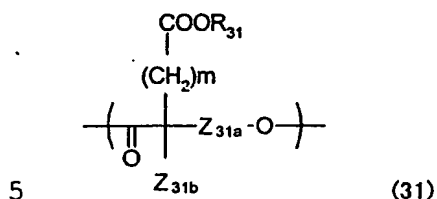
wherein  $R_{30}$  represents OH, a halogen atom, ONa, OK, or  $\text{OR}_{30a}$ ,  $R_{30a}$  and  $A_3$  are each independently selected from groups each having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure, or a substituted or unsubstituted heterocyclic structure, and when multiple units exist,  $R_{30}$ ,  $R_{30a}$ , and  $A_3$  each independently have the above meaning for each unit,



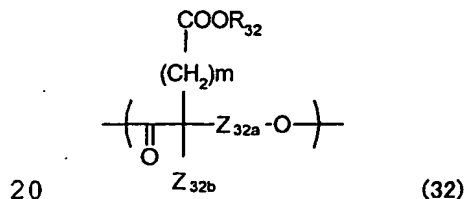
wherein R represents  $-\text{A}_1-\text{SO}_2\text{R}_1$ .  $\text{R}_1$  represents OH, a  
 halogen atom, ONa, OK, or  $\text{OR}_{1a}$ ,  $\text{R}_{1a}$  and  $\text{A}_1$  each  
 independently represent a group having a substituted  
 5 or unsubstituted aliphatic hydrocarbon structure, a  
 substituted or unsubstituted aromatic ring structure,  
 or a substituted or unsubstituted heterocyclic  
 structure,  $\text{Z}_{1a}$  represents a linear alkylene chain  
 having 1 to 4 carbon atoms, the linear alkylene chain  
 10 has at least one linear or branched alkyl group, or  
 at least one alkyl group containing a residue having  
 any one of a phenyl structure, a thienyl structure,  
 and a cyclohexyl structure at a terminal thereof,  $\text{Z}_{1b}$   
 15 represents a hydrogen atom, or a linear or branched  
 alkyl group, aryl group, or aralkyl group which may  
 be substituted by an aryl group, m represents an  
 integer selected from 0 to 8, and when multiple units  
 exist, R,  $\text{R}_1$ ,  $\text{R}_{1a}$ ,  $\text{A}_1$ ,  $\text{Z}_{1a}$ ,  $\text{Z}_{1b}$ , and m each  
 independently have the above meaning for each unit.

20        9. A method of producing a polyhydroxyalkanoate  
 containing a unit represented by the chemical formula  
 (32), comprising the step of hydrolyzing a  
 polyhydroxyalkanoate containing a unit represented by

the chemical formula (31) in the presence of an acid or an alkali or the step of subjecting the polyhydroxyalkanoate to hydrogenolysis including catalytic reduction,



wherein  $R_{31}$  represents a linear or branched alkyl or aralkyl group having 1 to 12 carbon atoms,  $Z_{31a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{31b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group,  $m$  represents an integer selected from 0 to 8, and when multiple units exist,  $R_{31}$ ,  $Z_{31a}$ ,  $Z_{31b}$ , and  $m$  each independently have the above meaning for each unit,



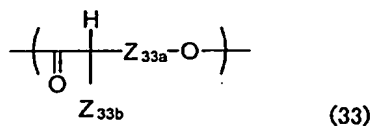
wherein  $R_{32}$  represents hydrogen or a group for forming

a salt,  $Z_{32a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{32b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group,  $m$  represents an integer selected from 0 to 8, and when multiple units exist,  $R_{32}$ ,  $Z_{32a}$ ,  $Z_{32b}$ , and  $m$  each independently have the above meaning for each unit.

10. A method of producing a polyhydroxyalkanoate containing a unit represented by the chemical formula (35), comprising the steps of:

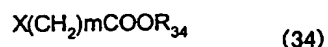
allowing a polyhydroxyalkanoate containing a unit represented by the chemical formula (33) to react with a base; and

allowing the compound obtained in the foregoing step to react with a compound represented by the chemical formula (34),

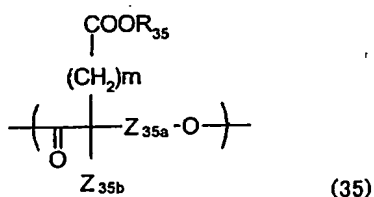


wherein  $Z_{33a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least

one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{33b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and when multiple units exist,  $Z_{33a}$  and  $Z_{33b}$  each independently have the above meaning for each unit,



wherein  $m$  represents an integer selected from 0 to 8,  $X$  represents a halogen atom, and  $R_{34}$  represents a linear or branched alkyl or aralkyl group having 1 to 12 carbon atoms,

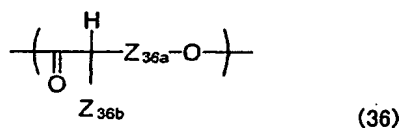


wherein  $R_{35}$  represents a linear or branched alkyl or aralkyl group having 1 to 12 carbon atoms,  $Z_{35a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{35b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may

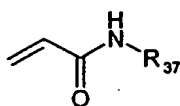
be substituted by an aryl group, m represents an integer selected from 0 to 8, and when multiple units exist,  $R_{35}$ ,  $Z_{35a}$ ,  $Z_{35b}$ , and m each independently have the above meaning for each unit.

- 5 11. A method of producing a polyhydroxyalkanoate containing a unit represented by the chemical formula (38), comprising the steps of:

allowing a polyhydroxyalkanoate containing a unit represented by the chemical formula (36) to  
 10 react with a base; and  
 allowing the compound obtained in the foregoing step to react with a compound represented by the chemical formula (37),

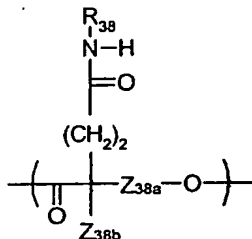


- 15 wherein  $Z_{36a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain has at least one linear or branched alkyl group, or at least one alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a  
 20 cyclohexyl structure at a terminal thereof,  $Z_{36b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and when multiple units exist,  $Z_{36a}$  and  $Z_{36b}$  each independently have the  
 25 above meaning for each unit,



(37)

wherein  $\text{R}_{37}$  represents  $-\text{A}_{37}-\text{SO}_2\text{R}_{37a}$ .  $\text{R}_{37a}$  represents OH,  
 a halogen atom, ONa, OK, or  $\text{OR}_{37b}$ ,  $\text{R}_{37b}$  and  $\text{A}_{37}$  are each  
 independently selected from groups each having a  
 5 substituted or unsubstituted aliphatic hydrocarbon  
 structure, a substituted or unsubstituted aromatic  
 ring structure, or a substituted or unsubstituted  
 heterocyclic structure, and when multiple units exist,  
 $\text{R}_{37}$ ,  $\text{R}_{37a}$ ,  $\text{R}_{37b}$ , and  $\text{A}_{37}$  each independently have the  
 10 above meaning for each unit,



(38)

wherein  $\text{R}_{38}$  represents  $-\text{A}_{38}-\text{SO}_2\text{R}_{38a}$ ,  $\text{R}_{38a}$  represents OH,  
 a halogen atom, ONa, OK, or  $\text{OR}_{38b}$ ,  $\text{R}_{38b}$  and  $\text{A}_{38}$  each  
 independently represent a group having a substituted  
 15 or unsubstituted aliphatic hydrocarbon structure, a  
 substituted or unsubstituted aromatic ring structure,  
 or a substituted or unsubstituted heterocyclic  
 structure,  $\text{Z}_{38a}$  represents a linear alkylene chain  
 having 1 to 4 carbon atoms, the linear alkylene chain  
 20 has at least one linear or branched alkyl group, or  
 at least one alkyl group containing a residue having

any one of a phenyl structure, a thienyl structure,  
and a cyclohexyl structure at a terminal thereof, Z<sub>38b</sub>  
represents a hydrogen atom, or a linear or branched  
alkyl group, aryl group, or aralkyl group which may  
5 be substituted by an aryl group, and when multiple  
units exist, R<sub>38</sub>, R<sub>38a</sub>, R<sub>38b</sub>, A<sub>38</sub>, Z<sub>38a</sub>, and Z<sub>38b</sub> each  
independently have the above meaning for each unit.